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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/206,027	12/04/1998	BARNEY M. COHEN	AMAT/3049/MD	4950

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APPLIED MATERIALS, INC.
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EXAMINER	
VINH, LAN	

ART UNIT	PAPER NUMBER
1765	32

DATE MAILED: 03/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/206,027	Applicant(s) COHEN ET AL.	
	Examiner LAN VINH	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 December 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-8 and 10-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-8 and 10-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. The appeal brief filed on 12/30/2002 has been considered. However, the argument presented in the brief is moot in view of the following new ground of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3, 5, 6, 7, 24-25, 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Konecni et al. (EP 0849 779 A2) in view of Van Cleemput et al (US 6,395,150)

Konecni discloses a process for forming a semiconductor structure using plasma etching comprising exposed a patterned substrate to a plasma generated from a gas mixture of argon, helium and hydrogen in a processing chamber/ a plasma generated from a gas mixture consisting of argon, helium and hydrogen (col 3, lines 52-57; col 6, lines 40-47 and fig. 4)

Unlike the instant claimed invention as per claims 1, 3, 24, Konecni does not disclose the specific percent by volume (etchant concentration/process gas flow rate) of argon, helium, hydrogen in the gaseous mixture although Konecni discloses that his method comtemplates any suitable flow rates of the gases (col 4, lines 1-2)

However, Van Cleemput, in a process for filling gaps on substrate, discloses varying the flow rate of argon to affect the etch rate (col 2, lines 9-10). Van Cleemput also discloses that the etch/dep ratio can be controlled by varying the flow rate of the process gas (col 2, lines 6-7)

Since Konecni discloses that any suitable flow rates of gas can be used, it would have been obvious to vary Konecni's argon flow rate in view of Van Cleemput teaching because Van Cleemput teaches that etch rates are typically increased by increasing the flow rate of argon. Van Cleemput serves as evidence that the flow rate of the process gases is result effective variable. It has been held that the discovery of an optimum value for result variables is within the purview of routine experimentation by the person ordinary skill in the art. In re Boesch, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980)

Regarding claim 5, Konecni discloses that the substrate surface comprises silicon oxide (col 5, lines 24-26)

Regarding claim 6, Konecni discloses that the plasma is capacitively and inductively powered by bias power (col 3, lines 42-44)

Regarding claims 7, 28, Konecni discloses introducing argon, helium, hydrogen into the processing chamber to establish a low or vacuum pressure of 10^{-7} to 10^{-8} Torr (col 4, lines 34-35;col 6, lines 30-45)

Regarding claim 30, Konecni discloses generating the plasma by delivering power level of between 150-450 W to the processing chamber (col 3, lines 40-43)

4. Claims 1, 3, 5, 6, 7, 24-25, 27-30 are also rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al. (US 5,534,445) in view of Van Cleemput et al (US 6,395,150)

Tran discloses a method for fabricating a thin film transistor. This method comprises the step of exposing a patterned substrate to a plasma generated by a gas mixture of hydrogen with inerts gases such as argon and helium/a gas mixture consisting of argon, helium and hydrogen (col 4, lines 49-51).

Unlike the instant claimed invention as per claims 1, 3, 24, Tran does not disclose the specific percent by volume (etchant concentration/process gas flow rate) of argon, helium, hydrogen in the gaseous mixture.

However, Van Cleemput, in a process for filling gaps on substrate, discloses that the etch/dep ratio can be controlled by varying the flow rate of the process gas (col 2, lines 6-7)

Van Cleemput serves as evidence that the flow rate of the process gases is result effective variable. It has been held that the discovery of an optimum value for result variables is within the purview of routine experimentation by the person ordinary skill in the art. In re Boesch, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980)

Regarding claim 5, Tran discloses that the substrate surface comprises silicon oxide (col 4, lines 20-21)

Regarding claim 6, Tran discloses that the plasma is derived by radio frequency supply (col 4, lines 56-57) reads on the plasma is capacitively and inductively powered

Regarding claims 7, 28, Tran discloses a pressure in the chamber at 180 mTorr (col 5, lines 47-48)

Regarding claim 30, Tran discloses generating the plasma by delivering power level of 20 W to the processing chamber (col 4, lines 47-49)

5. Claims 4, 8, 10-23, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Konecni et al. (EP 0849 779 A2) in view of Van Cleemput (US 6,395,150) and further in view of Kennard (US 5,935,874)

Claims 4, 8, 10-23, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al. (US 5,534,445) in view of Van Cleemput (US 6,395,150) and further in view of Kennard (US 5,935,874)

Konecni as modified by Van Cleemput has been described above in paragraph 3. Tran as modified by Van Cleemput has been described above in paragraph 4. Unlike the instant claimed inventions as per claims 4, 8, 14, Konecni and Van Cleemput/Tran and Van Cleemput do not specifically disclose the step of increasing the helium content/flow rate of the plasma to increase etching of the patterned substrate surface.

However, Kennard discloses a method for plasma etching a trench comprises the step of adding/increasing a flow volume of helium to a plasma etching gas mixture (col 3, lines 58-60)

Therefore, one skilled in the art would have found it obvious to modify Konecni and Van Cleemput/Tran and Van Cleemput by increasing the helium content/flow rate to the gas mixture as per Kennard especially because Kennard teaches that it is believed that

the addition of a relatively high flow volume of helium improves the directionality of the etch by increasing the ion energy, thereby increasing the vertical etch rate into the trench (col 4, lines 5-9). Furthermore, since it has been held that the discovery of an optimum value for result variables (i.e. flow rate) is within the purview of routine experimentation by the person ordinary skill in the art. In re Boesch, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980). Therefore, it would have been obvious to adjust Konecni and Van Cleemput/Tran and Van Cleemput helium flow rate by optimizing the same by conducting routine experimentation for the purpose of obtaining the best etch rate.

Regarding claims 10, 15, 18-20, the detailed discussion regarding the specific claimed flow rates has been discussed above in paragraph 3.

5. Claims 31-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Konecni et al. (EP 0849 779 A2) in view of Kennard (US 5,935,874) and further in view of Van Cleemput et al (US 6,395,150)

Konecni discloses a process for forming a semiconductor structure using plasma etching comprising exposed a patterned substrate at a vacuum pressure of 10^7-10^8 Torr to a plasma generated from a gas mixture of argon, helium and hydrogen in a processing chamber at a power of 150-450 W (overlaps the claimed range of between 300-450 Watts / a plasma generated from a gas mixture consisting of argon, helium and hydrogen at a power level between about 300-450 Watts (col 3, lines 52-57; col 6, lines 40-47 and fig. 4)

Unlike the instant claimed inventions as per claims 31, 36, Konecni does not specifically disclose the step of increasing the helium content/flow rate of the plasma to increase etching of the patterned substrate surface.

However, Kennard discloses a method for plasma etching a trench comprises the step of adding/increasing a flow volume of helium to a plasma etching gas mixture (col 3, lines 58-60)

Therefore, one skilled in the art would have found it obvious to modify Konecni by increasing the helium content/flow rate to the gas mixture as per Kennard especially because Kennard teaches that it is believed that the addition of a relatively high flow volume of helium improves the directionality of the etch by increasing the ion energy, thereby increasing the vertical etch rate into the trench (col 4, lines 5-9).

Konecni and Kennard not disclose the specific vacuum pressure, the percent by volume (etchant concentration/flow rate) of argon, helium, hydrogen in the gaseous mixture although Konecni discloses that his method comtemplates any suitable flow rates of the gases (col 4, lines 1-2)

However, Van Cleemput, in a process for filling gaps on substrate at a pressure of below 10 mTorr, discloses that the etch/dep ratio can be controlled by varying the flow rate of the process gas (col 2, lines 6-7, col 3, lines 57-58)

Van Cleemput serves as evidence that the flow rate of the process gases is a result effective variable. It has been held that the discovery of an optimum value for result variables is within the purview of routine experimentation by the person ordinary skill in the art. In re Boesch, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980)

Regarding claims 32, 37, fig. 2 of Konecni shows a patterned substrate having a contact region/feature 36 having a depth greater than the width (aspect ratio of the contact or feature) reads on the patterned substrate comprise a feature having an aspect ratio greater than about 4 to 1.

The limitations of specific volume of the etchants, as recited in claims 33-34, 38-39, have been discussed above.

Regarding claims 35, 40, the limitations of adjusting the gases volume/ flow rates by increasing/decreasing the gas volume has been discussed above.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAN VINH whose telephone number is 703 305-6302. The examiner can normally be reached on Monday-Friday 8:30 -6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, BENJAMIN L UTECH can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

LV
March 16, 2003